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ABSTRACT

One of a series of seven guides to developing the skills of quality circle members, this workbook is intended to introduce participants in creative problem solving workshops to literature on the subject as well as to provide tools for creative problem-solving. Contents include introductory activities, an overview of creative problem-solving, and sections on strategies for three general phases of problem-solving: (1) problem acceptance, perception, analysis, and definition; (2) generating and developing alternatives; and (3) evaluating, decision forming, and decision making. Also discussed are additional problem solving tools, breaking down blocks to creative problem-solving, continuing skill development, and review tests. Notes to trainers and an annotated bibliography accompany the text. Appendixes include actions for reaching consensus, proposed ground rules, factors in problem-solving, and the median estimate method. (MJL)

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CREATIVE PROBLEM SOLVING IN QUALITY CIRCLES

prepared by
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June, 1982

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A Forethought

"Cybernetics* show that there are four necessities if any system is to function.

> The first necessity is that there be accurate movement of information: in human terms this means honesty.
>
> The second necessity is that some parts of the system be willing to bring about change when change is needed: in human terms this means responsibility.
>
> The third necessity is that no part of the system try to take over the rest of the system: in human terms this means humility.
>
> The fourth necessity is that no part of the system try to preserve its exact place in the system but be willing to be flexible as conditions change: in human terms this is love."

From An Alternative Future for America II, Robert Theobald, pgs. 39-40

* The study of human control systems and of mechanical and electrical systems designed to replace them.

FOREWORD

This monograph is one of a series developed for the Educational Quality Circles Consortium, a Title IV-C Developmental Innovative Project for which the San Mateo County Office of Education is the LEA (Local Education Agency).

The primary foci of the project are to study the industrial model of quality circles and develop a prototype for educational quality circles, to develop appropriate training materials, and to use these in the training of resource personnel and school level staff members to establish circles in each of four target schools.

Through the development of effective circles in the schools, it is perceived that staff and students will experience greater feelings of satisfaction and empowerment which will in turn lead to improvement in student achievement, attendance, discipline and problem solving.

ACKNOWLEDGMENTS

This workbook pulls ideas from many sources -- other practitioners, books, and from the experiences I've had in creative problem solving with many groups of people.

I'd like to acknowledge the very large debt I owe to the work of David Straus and Michael Doyle of Interaction Associates, (San Francisco, CA) who provided me with the definition of a problem as "a situation someone wants to change;", to David Sibbet who has been a leader and colleague in the development of group graphics, Carol Sanford, my colleague for several years, and to the authors of the Universal Traveller, Conceptual Blockbusting and the staff of the Creative Problem Solving Foundation.

I would particularly like to thank Dr. Cecil Reeves of the San Mateo County Office of Education for his asking me to develop this workbook and Margaret Lyons who patiently and good humoredly typed and re-typed its pages.

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INTRODUCTION

This workbook and its associated workshop are for:

- Quality Circle members
- Other teachers
- Other staff
- Parents
- Senior High school students
- Junior High school students

The text is organized as a workbook for a one to two day workshop in Creative Problem Solving. The goals and objectives for that workshop are listed at that place in the sequence where they would occur in the workshop. In addition to material that would be used in the workshop, there is supplementary material both at appropriate points and in the appendix.

Some Initial Comments to Trainers Using This Workbook

This workbook is for both trainers and participants. It seeks to set up an "each one teach one" process so that after initial training of a core group, that core group works with staff at schools, that staff works with students and parents, and they, in turn, work with others.

For this reason the workbook contains "Notes to Trainers" at the bottom of many pages that refer to the PROCESS to be used in presenting the material. The importance of becoming explicitly aware of the processes we all use is part of the message of this book.

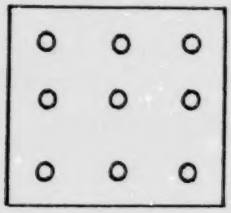
There are in print a large number of books and articles on Creative Problem Solving, and a few selected books are listed in the Annotated Bibliography. I would strongly recommend that each quality circle acquire copies of the books listed and put them to use. This brief monograph is intended to introduce participants to this body of knowledge and to provide some immediately useful tools for Creative Problem Solving.

Some useful and novel tools for creative problem solving, not mentioned in readily available books are presented in addition to more standard approaches such as brainstorming.

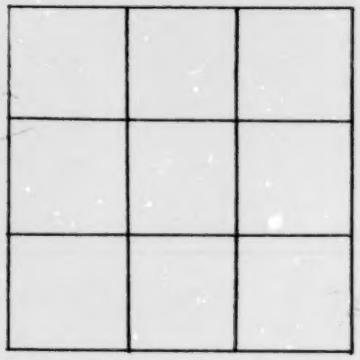
Pretest

For fun:

1. Draw four straight lines without lifting your pencil so that all dots are intersected by a line.



2. How many squares are there in this figure?



3. Draw a picture of a square peg that also fits into Round and triangular holes.

More seriously:

4. List and describe stages of a group problem solving process.

5. Describe four problem solving processes that are helpful in group problem solving.

6. List three blocks to effective group problem solving.

7. Distinguish the concepts of "process" and "content."

PARTICIPANT'S INTRODUCTIONS - (Peter-Pauline Method)

Please work with one other person. You have five minutes to interview each other to learn

1. Names
2. Classrooms/jobs — N2
3. One thing the other person likes to do that others are not likely to know and that he or she is willing to share with the group.

GO... — N4

When you introduce your partner, you remain seated and the person being introduced stands up. — N5,6

Notes to Trainer

N1. Facilitator can use this as an opportunity to learn group member names.

N2. Write these three items on a flip chart.

N3. Trainer places people into pairs. (Throughout the workshop it is helpful to continue to have people form new pairs.) After this first exercise let people form their own pairs. One instruction is, "Work in pairs with someone you've not yet worked with today."

N4. Give people a half-way mark and a one minute-to-the-end warning.

N5. Go around the room in order and have each person stand up one at a time and be introduced by the partner.

N6. Trainer can welcome people and rehearse names with a simple, "Welcome, Jim."

EXPECTATIONS

What do you hope to have learned, done by the end of the workshop?	N1
What are your expectations?	N2

Notes to Trainers

N1. People talk in pairs with person on other side - not the person they interviewed.

N2. Write the expectations on flip chart paper.

AGENDA

- Introductions
- Expectations
- Agenda Review
- Objectives
- Overview
- Climate for Creative Problem Solving in Quality Circles
- Phases of Problem Solving
- Blocks to Creative Problem Solving
- Tools for Creative Problem Solving
- Decisions and Creative Problem Solving
- Evaluation - Looking Sideways at Your Process
- Next Steps in Learning
- Concluding Comments

Notes to Trainer

Go over agenda and relate it to expectations in specific ways. Show how the workshop does or does not respond to participants' expectations.

OBJECTIVES

This workshop presents an introduction to Creative Problem Solving. By the conclusion of this workshop, participants will have been introduced to:

1. An overview of creative problem solving
2. Three phases (and smaller steps within each phase) of problem solving
3. Blocks to creative problem solving and some ways around the blocks
4. Tools and strategies for:
   a. Problem acceptance and perception, definition and analysis.
   b. Generating and developing alternatives
   c. Evaluating, decision forming and decision making
5. Some general process tools
6. Next steps in building creative problem solving skills

OVERVIEW

Key Points

- Creative problem solving is a skill you already have to some degree
- Creative problem solving is at the core of responding to new conditions or enabling you to change situations you don't like
- Creative problem solving links into nearly everything else

Let's look at the words:

CREATIVE- from CREATE - (to cause to grow)
being able to cause; to come into existence; to make; to design; having or showing imagination

PROBLEM- (to throw/drive forward)
a question posed for solution consideration; a question, person,situation of matter that is perplexing or difficult

OPPORTUNITY- (at or before the port or harbor)
a combination of circumstances favorable for the purpose

SOLVING/RESOLVING- (let go, set free)
to find or provide a satisfactory answer or explanation for

Notes to Trainers

N1. What is the difference/similarity of problem and opportunity? What images are contained in each?

N2. What in "problem" has caused it to have a negative connotation?

N3. What are the connotations of "creative" that can lead to people feeling they are <u>not</u> creative?

AM I CREATIVE? YES!

1. Look around you - what has been created by creative people	N1
2. Think back - what do you remember <u>others</u> creating	
3. What are some ways of describing what is creative	
4. Think back to a time when <u>you</u> created something. Identify the situation, attitude of mind, approach, etc. that enhanced <u>your</u> creativity. What did (does) feeling creative feel like?	N2
5. What seems essential for <u>your</u> creativity - individually? - in groups? (We will get to what blocks creativity later.)	N3,4,5

Notes to Trainers

N1. Work alone.

N2. Work with a partner to get at what was involved.

N3. Creativity is an attitude of mind -- a willingness to ask "what if..." and "I wonder..."

N4. Our focus is on enhancement of your <u>innate capability</u> to be creative -- this includes giving your permission to be creative and describing some useful tools.

N5. Asking who is <u>most</u> creative is not likely to be helpful.

CLIMATE FOR CREATIVE PROBLEM SOLVING IN QUALITY CIRCLES

How does the Peter-Pauline type of introduction help build a climate in this group that will enable us to work together effectively as a Quality Circle? N1

And what else?

And what else?

Let's talk further about the climate we need to use creative problem solving effectively. What kind of agreements, N2
operating procedures, decision N3
rules would help us work together N4
as a Quality Circle?

And what else?

And what else?

Notes to Trainer

N1. Facilitator can ask specific questions such as:

"How does working with a partner help?"

"How does sharing one thing I like to do help?"

"How does having the person introduced stand up help?"

N2. What kind of climate will allow us to see problems as situations with opportunities for positive change?

N3. What climate will allow us to address issues we might otherwise avoid?

N4. Two sample sets of ground rules for working groups are included in the Appendix under "Actions for Reaching Consensus" and "Proposed Ground Rules."

A Climate Supportive of Creative Problem Solving

Take time to establish a climate that allows you to address key issues thoughtfully and creatively, that allows the crackpot idea to become the crackerjack idea. Ground rules and understandings about how we work together do help. So does being clear about our Quality Circle decision process. Do we strive for consensus? What is our fallback process if we do not reach consensus in the time available? What is the relationship of the Quality Circle to the formal decision making structure?

Relationships with those outside our quality circle -- such as other teachers, staff, students and parents -- are often the key to the success of plans and ideas generated in the Quality Circle. Roles within the Quality Circle are equally important.

Do we want a facilitator and recorder?

Will we use group memory? What physical arrangements will work for us? Arrangement of space; quality of light; refreshments.

What attitudes and qualities will be needed?

- Fun and exciting; thoughtfully critical and evaluative -- how do we balance between the wild and crazy and the realistic and grounded?
- Resilient, enthusiastic, centered.
- Open, wanting to see everyone's interests attended to.
- Tolerant of ambiguity; willing to look at new, different and untried ways to do things.
- Rewarding to those willing to be creative and to those who resolve problems and create opportunities.

Process and Content

It is helpful to make a distinction between process and content.

. Imagine you are chewing gum -- move your jaw.	N1
. The gum is the **content**; the chewing is the **process.**	
. What other things can you chew besides gum?	N2
. What else can you do with gum besides chew it?	N2
. How is this distinction helpful?	

Notes to Trainers

N1. Really get people moving their jaw.

N2. Get out all kinds of ideas - encourage a little craziness; it will loosen up the group.

PHASES OF PROBLEM SOLVING

"A problem is a situation someone wants to change."

Some introductory comments:

It is possible to identify specific phases of problem solving. Writers label them differently and group them differently. This workbook uses four broad groupings:

1. **Problem Acceptance and Perception, Definition and Analysis**

   - **Acceptance**

     Looking at the situation and accepting the challenge to change it into something better; becoming involved; connecting with the problem responsibly; exploring whose problem it is.

   - **Perception**

     Moving from felt need to identifying specific incidents which arouse feelings; people perceiving the situation differently (remember the blind men and the elephant);

   - **Definition:**

     What situation do we want to replace the current situation with -- in general (goals), specifically (objectives); what are the points of controversy; what is included and what is not included*; identification of assumptions and ambiguities.

   - **Analysis**

     Getting to know all aspects of the problem -- the situation you want to change -- intimately; the details; the relation of the pieces of the problem to the rest of your world; the problem's parts; the relation of parts to each other; the facts; the dynamics of the situation.

---

* Note: Defining (scoping) the problem too narrowly may over-constrain or eliminate some creative solutions available, while defining it too broadly may make it hard to get a handle on the problem.

2. **Alternative Generation and Development**

Using your understanding of where you are and where you want to get to - create, find,learn from others, invent, piece together ways to get from "is" to "want"; open up to possibilities, to "what if"... take new ideas and develop them into complete solutions.

3. **Evaluating, Decision Forming and Decision Making**

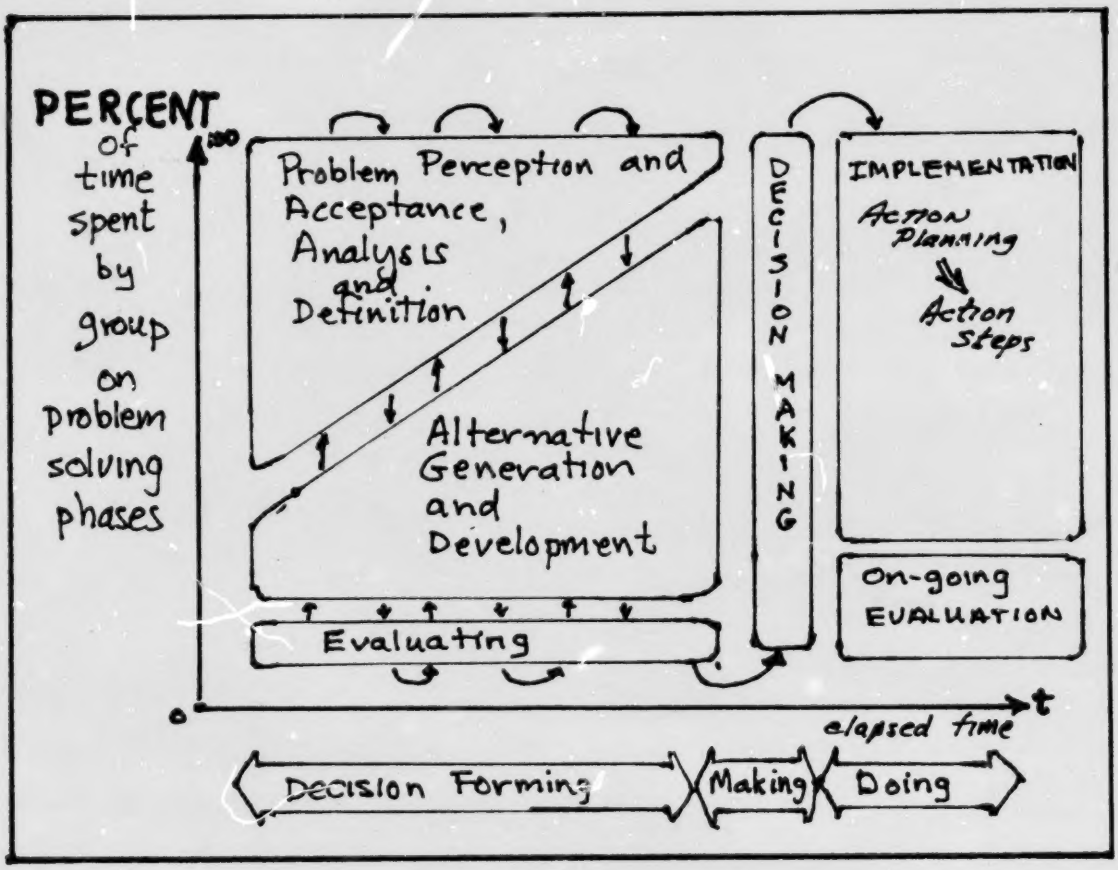
Choosing pieces of trial solutions and evaluating them; establishing criteria to guide evaluation; relating solutions to "is," "want," and "barriers"; making a choice; evaluating both process and substance as you go along.

4. **Implementing the Decision (and ongoing evaluation)**

Planning in detail and then giving physical form or action to the choice made; making mid-course corrections based on evaluative feedback; doing it.

Creative Problem Solving is Cyclical

It would be simpler, though not as powerful or as much fun, if we started at the beginning, went through the middle and got to the end of the problem solving sequence. However, a more accurate picture shows this:



In the appendix there is a list of some factors to think about in problem solving.

Notes to Trainer

N1. Creative problem solving is cyclical. While the time spent in each phase often varies as shown, unexpected events late in the process can require going back to problem definition or one of the earlier steps.

N2. Note that the final making of the decision is deferred until late in process. Rather we concentrate on forming an effective decision that people find acceptable, during most of the process.

Additional Comments on Problem Solving Phases

1. Not all situations warrant the same level of effort in developing a quality solution that has high acceptance among all parties.

Add your own comments and observations below:

OVERVIEW OF REMAINDER OF WORKSHOP

BLOCKS

What stands in way of individuals and groups using a creative problem solving model

TOOLS

Specific processes that can be used in each stage of problem solving

DECISIONS

Developing and making choices among alternative approaches

BLOCKS: Historical Context for Creative Problem Solving in Schools

In developing effective Quality Circles in schools, there is a need to consider how schools differ from industry and how much to modify the notion of Quality Circles to fit schools.

Some things that might inhibit effective Quality Circles and hence may need conscious attention are:

1. Teachers operate alone and with relative autonomy; they have little interpersonal support. They are often not used to working with groups of peers.

2. The emphasis in classrooms is on testing and judging. This might carry over into Quality Circles.

3. Remote authorities often make rules; "I have no control," "I've not been included in the past, so why participate now?" Sometimes advice has been sought but not taken, with hurt, cynicism and mistrust the result.

4. Any past labor-management difficulties.

5. Diminishing resources and reduction in the work force.

Conscious and unconscious blocks stand in the way of anyone's using his or her creative capacities to discover and develop new situations that we would find more effective and that we can live with better than with existing situations. Note that we defined a problem as "a situation someone wants to change."

There are many sources of blocks*:

Fears of side effects and repercussions, angers and resentments;

Taboos, norms, cultural set;

Habits, perceptions and prejudices;

Dynamics of groups, conflicting personal styles, ineffective, confused process;

Limits of experience and knowledge;

Limits on frameworks and concepts.

---

* See Conceptual Blockbusting

Exploring Blocks and Barriers

Work with one other person to list blocks you have seen operating within others or other groups that you believe get in the way of creative problem solving.	N1
Review lists (in pairs) identifying the blocks each pair believes will be most significant for this Quality Circle. Each pair of people select 2-3 blocks they believe most need discussion by the Quality Circle. Start with block having most checks and brainstorm list of ways to reduce its significance.	N2
Develop at least one way to address ten top group blocks.*	N3
Review list of blocks for those that are your own <u>personal</u> blocks. Work with one other person to reduce impact of this block on you. Does this suggest specific ground rules, processes, roles needed in our Quality Circle?	

Notes to Trainer

N1. Facilitator go around group. Ask each person for <u>one</u> block. After a person has identified one block ask for other related blocks people have identified. (Write each <u>set</u> of blocks on new group memory sheet.)
(Product: organized list of blocks).

N2. Place one check for each pair by item selected.

N3. You are here using the blocks to suggest things you will need to address if Quality Circle is to be effective.

N4. Theory suggests that reducing barriers and forces against creative problem solving in Quality Circles may be the best way to increase the effectiveness of your Quality Circle.

*For example, a likely barrier is "lack of time." Invent ways to create teacher time -- perhaps by inventing ways of teachers doing a smaller number of some things that they now do or ways of getting help to do those tasks. (Note: the reasons why teachers cannot ask others for help may provide an interesting list of blocks.)

TOOLS

Key Points

Imagine building a house - what tools would you need?

- physical tools
- conceptual tools

It is possible tc build a house with little more than a hammer and a saw, nails and sheets of plywood. But, you can build a better house faster with more sensitivity to the type of house needed if you have more tools and materials, and know how and when to use them.

This section presents a number of creative problem solving tools.

Just as a hammer can be put to many uses (hammering nails, holding up a sheet of plywood, prying out nails, hammering wood -- and what are some others?) so creative problem solving tools can be put to many uses.

Our aim in what follows is to expand the repertoire of tools you have available in creative problem solving in Quality Circles. The goal of creative problem solving is to develop and agree upon effective solutions that people feel are acceptable.

Some Observations about Tools and Creative Problem Solving

- In a situation of any complexity there are usually several objectives and interest -- often somewhat conflicting -- that you are satisficing* on.
- Asking questions is often more helpful, powerful and influential than making statements.
- Expand the range of options -- there are many ways to reach the same objective.
- Creative problem solving is a cyclical, somewhat jumbled process that goes back and forth from structured to intuitive approaches, from limited clarity to broad fuzziness -- and back.
- A broad repertoire of creative problem solving skills allows flexibility of response.
- In group creative problem solving, agreement on both process and on the substantive focus helps sanity and makes connections between parts of a problem clearer.

---

* "Satisficing" - meeting multiple objectives at a satisfactory level (versus optimizing on one objective).

- What strategies/tools do:
  - organize and focus the group's work
  - organize information in a way that it can be used
  - provide a vantage point from which to view the problem
  - elicit information needed collectively by the group to move ahead
  - build relationships between people
  - allow statements to be made that are derived from (often implicit) value stances
  - move from solution back to problem and back again to open up the solution space
  - develop a collectively known detailed understanding; develop a general understanding
  - develop a shared perception
  - develop a shared set of beliefs about how the world works
  - open people up to what others have to say
  - allow you to go slow - to avoid rushing to decisions

TOOLS FOR CREATIVE PROBLEM SOLVING

OVERVIEW

The tools* have been grouped into:

1. Problem Acceptance and Perception, Analysis and Definition

   - the easy-hard/unimportant-important chart
   - rainbow chart
   - assessment interview with feedback

2. Generating and Developing Alternatives

   - brainstorming and clustering on brainstormed lists
   - criteria-improved solutions
   - countering
   - not invented here
   - system description

3. Evaluating, Decision Forming and Decision Making

   - comparison
   - criteria matrix
   - voting plus
   - build up and eliminate
   - straw voting

* The tools included here are effective tools that (mostly) complement the tools described in How to Make Meetings Work, Chapter 16. The Quality Circle should also practice using the tools in Chapter 16. A second source of these 'software' tools is The Universal Traveller.

1.

PROBLEM ACCEPTANCE AND PERCEPTION, ANALYSIS AND DEFINITION

Key Questions N1

Acceptance:
Do we want to take this on?
Do we have the wherewithal?
Who owns the problem?

Perception:
How does it feel?
Best, worst, most likely outcomes? N2
How do different people see the problem?

Analysis:
Breaking the problem down, asking who, what, where, when, why, etc., getting an orderly understanding of all aspects of situation.

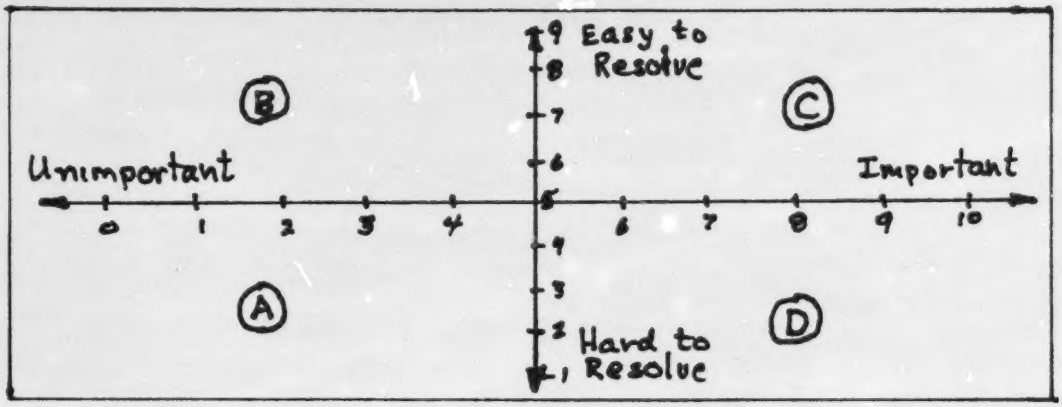
Definition:
Getting clear on objectives, on the essence of the problem, or distillation of facts and perceptions.

Notes to Trainer

N1. Draw the group out with discussion of each of these initial creative problem solving phases.

N2. These specific questions form tools for the group. See How to Make Meetings Work.

Tool 1 (Acceptance) - The Easy-Hard/Important-Unimportant Chart*



One method for sorting issues uses the group's collective estimate of each issue with respect to the issue's importance and to its ease of resolution.

1. Generate a list of issues you imagine that a Quality Circle group might take on.

2. Each person select one issue to be placed on the easy-hard/important-unimportant chart.

3. Use the median estimate** method to locate each issue, first estimating importance and then estimating difficulty.

4. Select one issue to work on from quadrant C. Good qualities for a workshop issue are: variety of approaches available, affects many people, collectively the workshop participants are knowledgeable about it.

5. Start defining the issue using the Rainbow Chart (Tool 2)

Note to Trainer

N1. In general, issues in Quadrant A are discarded; in Quadrant C issues are addressed immediately; in Quadrant B issues are addressed if individual members want to work out resolutions to be reviewed by the group; in Quadrant D one issue is selected, perhaps using some sense of the ratio of value, if resolved, to the effort required to resolve it.

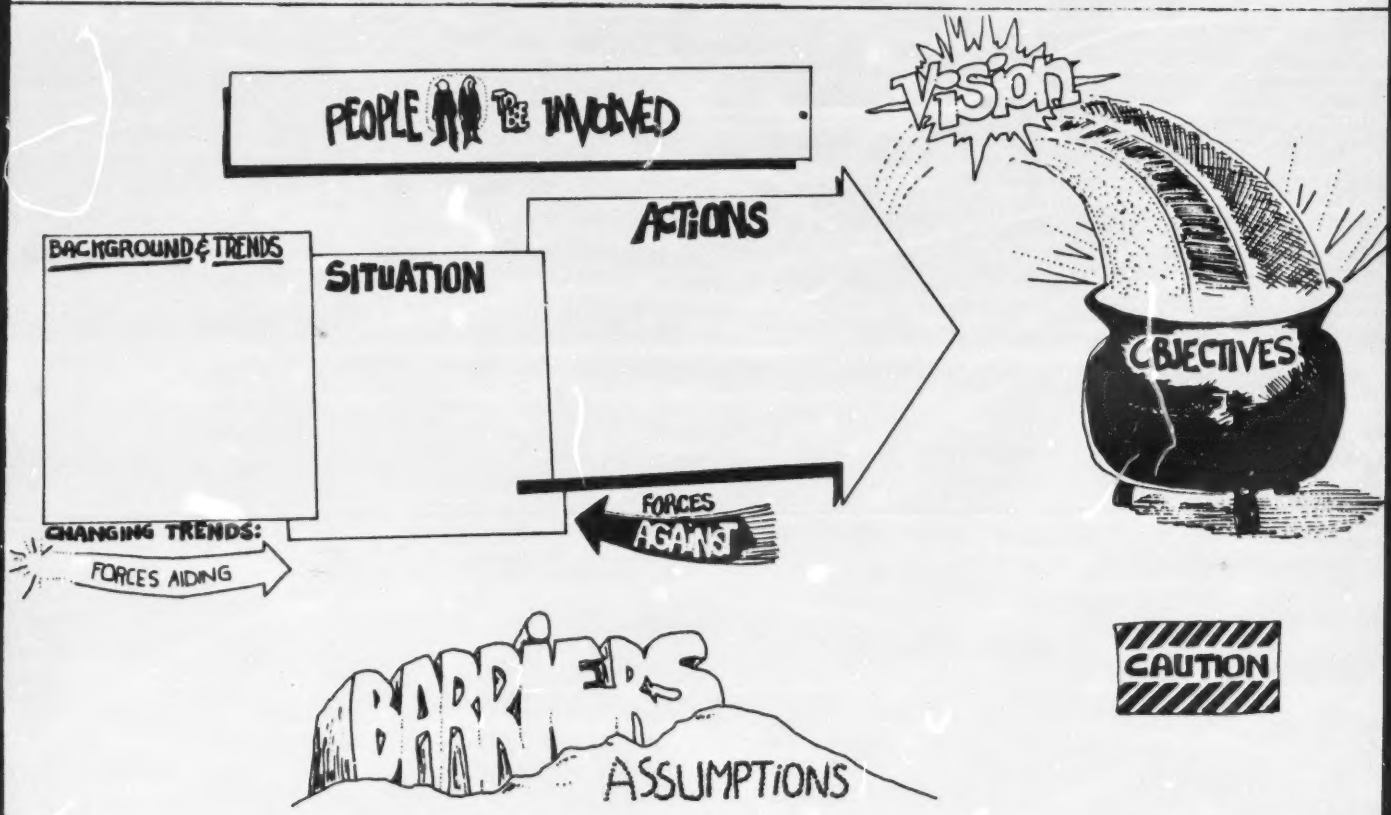
---

* Note: Credit goes to Bill Baker and Augie Schornia of the Alameda County Office of Education for this notion.

** See Appendix for median estimate method.

Tool 2 (Perception, Analysis, Definition) - The Rainbow Chart*

The Rainbow Chart is a graphic statement of "A problem is a situation someone wants to change."



* Copyright Forum on Community and the Environment, 1980. Permission granted for use in these Quality Circle Workshops.

In Figure 2 on the previous page we show the **Rainbow Chart.** Given the definition of a problem,

"A problem is a situation someone wants to change,"

the Rainbow Chart is used as a guide to asking questions.

Working in pairs (or as a group of the whole), Quality Circle members interview each other, asking - and recording on a sheet of paper - the questions in the following order: (Use the issue selected by Tool 1)

1. What IS the situation? (Note where information is missing). State it as a question.

2. What key events or trends led to this situation? What WAS?

3. What is our general goal or vision; what would we like the situation to be?

4. What are our specific objectives; what would the situation look like if it were changed to our liking; what do we WANT?

5. What forces against or barriers make it difficult to move from what is to what we want?

6. Are there important assumptions that need to be made explicit or need to be challenged?

7. What forces aiding make it easier to move from what is to what we want?

8. Who else needs to be involved to change the situation?

9. What cautions or pitfalls do we want to keep in mind (so as not to throw the baby out...)?

And finally,

10. What are some How's, some ways of moving from what is to what we want?

If the work has been done in pairs, the information can then be shared by getting one idea from each pair and then going back around the Circle until all ideas are out.

Note to Trainers

N1. Take the time to answer Questions 1-9 before figuring out HOW to solve the problem. If people must get out How's early, then ask how that solution is related to IS's, WANTS, BARRIERS, etc.

Tool 3 (Perception, Analysis, Definition) - The Assessment Interview with Feedback

Quality Circle members, using the Rainbow format for a general guide, develop specific questions to ask others who have knowledge of, or a stake in the situation.

Members then return and share this information with each other as part of this first problem solving phase.

(In some cases, gathering the information may require assurances of confidentiality and hence might require aggregation or even a third party as interviewer prior to presentation to Quality Circle or back to the respondents.)

After the information has been shared with each other, there is often value in sharing the information back with the school as a whole, perhaps in staff meetings in an elementary school or in prep period meetings in a high school.

INTERJECTION - Criteria for Evaluating Alternatives

Stop for a moment's reflection on the characteristics you collectively want your solution to the issue to have.

1. Given the issue, generate a list of criteria* that describe the kind of solution you want.

2. Group criteria into critically important, very important, and important. (See Appendix - Median Estimate method)

3. Generate sentences that amplify the meaning of the criteria.

4. Keep the criteria up on the wall as you generate alternatives.

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* Criteria are closely related to goals and objectives. They identify, (1) properties you want to optimize, e.g., minimize the distance students travel to school in a school closure issue and, (2) levels of service, e.g., not more than 28 students per teacher; criteria are the perspectives used to evaluate different solutions. See the Quality Circle monograph on "Making Decision in Quality Circles" for a specific sequence of steps using criteria and objectives to evaluate possible solutions.

2.

GENERATING AND DEVELOPING ALTERNATIVES

Key Points

- Importance both of getting out a wide range of (usually partial) options to stimulate thinking and then to use a variety of methods to develop the partial ideas into a full solution.

- If you have a hard time generating alternatives, it may be because you still are unclear on the problem.

- Remembering (or asking) what someone else did in a similar situation is often an effective way to generate alternatives, a starting point for developing solutions.

- Using innovations developed elsewhere (including Quality Circles) requires adapting them to local conditions.

- Opening up a problem and leaving it opened up often allows the reflective brain to come up with ideas in the shower the next morning.

Tool 4(a) Brainstorming

Everyone knows what it is -- sort of. The major ideas -- often forgotten -- are:

- Defer judgment
- Be wild and crazy
- Build on previously given ideas -- change them or flip-flop them. (Hitchhiking)
- Write the ideas up on the wall.
- Produce lots and lots and lots of ideas ("First let's get the ideas out -- we can pick out what we want to build on after we get the ideas.")

An excellent description of a way to run brainstorming in a group is in How to Make Meetings Work, Chapter 16.

The underlying concept in brainstorming is expanding the solution space. A large possible solution space is particularly helpful when different people have different wants with respect to the situation.

It is often helpful to have people initially brainstorm in pairs to get the widest possible range of ideas out without comparison to (and inhibition by) other ideas. Then shift to group brainstorming.

Another way of starting to brainstorm is first to brainstorm CATEGORIES of alternatives and then to brainstorm within each category.

Another useful procedure is to write ideas on 4" x 6" and 3" x 5" cards that are pinned (taped) to the wall. Using cards allows easy manipulation of the ideas. (Note: for large groups use 60# paper of 8-1/2" by 11" size so they can be seen from a distance.)

> Use brainstorming to generate a lot of alternatives for a selected problem situation.

Tool 4b (Developing Alternatives) - Clustering Brainstormed Lists

A brainstormed list contains a lot of partial solutions mixed with craziness and fun. A simple procedure can efficiently organize the list into clusters of related items.

1. Focusing on the issue from Tool 1, work in pairs to identify ideas from the brainstormed list that people want to develop further.

2. Start with one idea and relate other ideas from the list (or those that occur to people) to that nucleus. Put a check by the idea used. Ideas can be related to more than one nucleus.

3. Examine the ideas not checked.Pick one and attempt to add ideas to it, and then another, etc.

Tool 5 Criteria Improved Solutions

Use the criteria as viewpoints that suggest ways to improve the solutions. Consider the various ideas or clusters of ideas in the following way:

1. Take each idea (cluster) in turn.
2. Ask, "How can we increase the value of this idea on each criterion by adding to or modifying that idea (cluster)?"
3. Use criteria to identify particular areas of the ideas needing further work -- obstacles to be overcome.

Notes to Trainers

N1. Criteria for evaluating options are often considered formally part of the decision making stage with the recommendation that they be generated before options are developed. This process uses the criteria to improve proposed solutions.

Tool 6 (Optional) Countering

Brainstorming uses the energy derived from fun to create ideas.

Countering uses the energy produced by challenge (not threat) to improve ideas.

Countering stimulates on-the-spot creativity in a debate format.

1. Divide (randomly) the Quality Circle into two teams.
2. Select a cluster of ideas to be challenged.
3. Team A challenges Team B with "How can you deal with concern X?" or similar idea-generation questions. Team B responds with one or more ways to overcome the concern X. No direct evaluation of responses is allowed. Team A can only ask more questions.
4. After five to eight minutes the roles are reversed.
5. Ideas should be recorded as they come out.

Notes to Trainers

N1. Countering raises group energy and can feel like a conflict. Agreements are needed before a countering session as to ways to abort the process if needed. Also, be sure teams are shuffled after each countering. Done well, countering can increase the Quality Circle's resilience in the face of real internal conflict. The group may fear conflict and may need to be encouraged to avoid aborting prematurely. Also, people need to avoid challenging <u>people</u>; the challenge is to the <u>ideas</u>.

Tool 7 (Optional) NIH - Not Invented Here

Insist that the ideas used as starting places have been invented and used elsewhere. Use research to find them and then tailor them to meet local needs.

Tool 8 (Optional) System Description

Use Group Graphics* and cards to develop a large pictorial description of all facets of the system within which the problem exists. Include all solutions as part of the same wall graphic. (This assumes that the different (partial) solutions are addressing different parts of the problem). Where partial solutions address the same sub-problem, combine and/or select among solutions until the wall graphic contains a complete proposed resolution for all aspects of the problem.

* See Using Graphics with Groups

3. **EVALUATING, DECISION FORMING AND DECISION MAKING**

Key points

- Effective solutions for controversial situations that are acceptable to everyone more often emerge out of decision FORMING than out of making choices between solutions advanced by factions.

- The comparison of solutions can stimulate the group to find an integrated solution that synthesizes the different interests into one solution.

- Where uncertainty exists, a trial with evaluation for a fixed time period may allow acceptance of the solution and its implementation. The evaluation provides the information needed to reduce the uncertainty and suggest ways to improve the solution.

- If you have difficulty evaluating alternatives and forming decisions, it may be that:

  - the objectives are unclear
  - the criteria are stated as "positions" rather than as "interests" (which limits the alternatives considered).*
  - there are underlying value differences (which may or may not conflict).

* A "position" is really a proposed solution. An "interest" is an objective -- what we want the solution to achieve -- what we want without tying what we want to a particular solution or a particular way of getting it.

Tool 9 Comparison

9A Pairwise Comparison

Compare each solution with every other solution with each person independently scoring whether A is preferred to B or B to A using the pairwise comparison score sheet.

9B Comparison

1a. Indicate what the Quality Circle likes about A more than B and about B more than A, where A is one proposed plan and B is another proposed plan. N2

b. The Quality Circle can also compare solutions to reach the ideal solution.

c. Solutions can also be compared against a minimal acceptable end state - "which solution is more likely to exceed the minimum acceptable state."

2. Use the "like abouts" to generate a new solution containing desired qualities of the different solutions.

Notes to Trainers

N1. Comparison is often helpful in forming decisions by using the best (most liked) parts of various solutions.

N2. Pairwise comparison works best with 3-5 different protypical solutions - different approaches to resolution of a problem. More than five solutions requires more comparisons than most groups are willing to sit still for. (Five requires (5x4)/2 = 10 comparisons; 10 requires (10x9)/2 = 45)

Tool 10 - Criteria Matrix

1. Array the criteria by which the Quality Circle proposes to evaluate solutions as column headings and solutions as row headings.

2. Write all solutions on cards, categorize them into high, medium and low on a given criteria (using the critically important, very important, important median estimate method).

3. Record the results in the matrix using red (low), yellow (medium) and green (high) marking pens.

4. Review results discarding plans that consistently rate poorly. (Save valuable features of these plans.)

Tool 11 Voting Plus

When voting has been used, members who 'lost' can often be brought back into the group of those who find the plan acceptable by asking them if there is something that, if added, would enable them to feel comfortable enough with the solution to vote for it. If there is, and the majority of the group can accept it, then add it to the solution.

Additional Tools for Getting to Agreement

A number of additional decision forming and consensus building tools are described in How to Make Meetings Work, Chapter 16. Two tools are:

Build Up and Eliminate:

In "building" start with one solution and try to build an acceptable solution by adding to it elements that respond to people's concerns. In 'eliminate' seek to eliminate candidate solutions that no-one wants kept in. Go back and forth between these modes.

Straw Voting:

A show of hands to get a sense of the group is helpful, but use with caution lest straw voting become real voting before striving for consensus. At the same time, voting is an efficient way to get expressions of opinion. Remember to use it for that purpose, to avoid endless discussions that are the verbal equivalent of voting. It is ok to vote in seeking consensus as long as the vote is seeking information rather than binding the group to a course of action. Two fall backs from consensus:

Executive Decision - the boss decides

Majority Vote - Voting with a majority rule (or 2/3's or 3/4's)

Notes to Trainers

N1. When striving for consensus focus on agreements; be willing to back off and seek other creative additions when the group gets stuck between a couple of alternatives; sometimes both/and solutions exist, so choosing between A and B is not necessary.

N2. Your role is to facilitate the group's moving ahead without steamrolling a minority and at the same time helping minorities see possibilities that allow them to accept the emerging solution and/or suggest acceptable alternatives or additions.

EVALUATION - Looking Sideways at Your Process

At the end of each meeting set aside five to ten minutes to quickly but thoughtfully evaluate your meeting. In this way the whole Quality Circle gets to act as coach and gets the information needed to improve its meetings.

1. Let's quickly get out the pluses and minuses of the meeting/workshop. (Write them up.)

2. If any require some collective action to address, then agree on that action or set aside time at next meeting to address them.

CONTINUING YOUR SKILL DEVELOPMENT

Creative problem solving is a skill. Like other skills it requires practice to improve it. Some practice just comes along with living. In this workshop we have introduced some new tools which will probably require creating practice opportunities. The following experience provides insight into what such practice contains for effectiveness:

Learning an Aikido Move
(or some other complex physical movement)

1. Ask for a volunteer to teach. N1

"I am now going to tell you how to do Katate dori Shihonage irimi*:

Your uke (partner) faces you and grasps your left wrist with her/his right hand. You step left so you are at right angles to your uke with left foot back and right foot forward. At the same time extend your left arm forward to make a half circle in front of you. Twist your wrist toward you so as to make it easy to grasp your uke's right wrist with your right hand (with your thumb on your uke's pulse.... and stop. You are now about one quarter of the way through the technique.

2. Now you do it (to the participant). N2

3. What were you doing while I was telling you how to do this move?

4. Now observe how to do the move. N3

5. Now you do it. N4

6. Now you do it with corrective feedback from me. N5

7. How does this relate to your learning creative problem solving skills?

8. Observations

- being told how to do something complex is not the same thing as practicing it with feedback after seeing it done.
- seek low risk settings in which to try out the individual tools
- seek feedback from trusted observant friends and reflect yourself on the use of the tool.

* Literal meaning - "one hand holding" (right to left or left to right) "four corners throw."

Notes to Trainers

N1. Any multi-step procedure involving unfamiliar physical movement will work here.

N2. Laughter usually erupts here from the rest of the participants. The technique is too unfamiliar and complex to learn by telling only.

N3. Again, there are too many parts to watch -- feet, body as well as hands -- to grasp from a single demonstration.

N4. Trainer demonstrates move.

N5. Trainer tells, demonstrates and then has uke do it while giving corrective feedback.

PERSONAL NEXT STEPS

Write down below how, where and when and with whom you will make use of what we have covered today. Be specific. Promise less rather than more - select 1-2 ideas/techniques at one time.

I will make use of what we have learned today:

HOW:

WHERE/WHEN:

WITH WHOM:

CONCLUDING COMMENTS

Key Points

- You are creative. We all are.

- You can increase your creative problem solving skills through practice. Practice in low-risk settings first on issues that are not critical or overwhelmingly emotional so you have energy to look at your process and a good chance of feeling successful.

- Creative problem solving combined with excellent working relationships among people committed to high quality schools is the essence of the Quality Circle.

REVIEW TESTS

1. **Closed book**

   a. - List four creative problem solving phases with steps in each.
   - Describe one tool each for each three phases of problem solving we discussed.

   b. - Take one real problem situation and sketch out one possible problem solving sequence. Go through all phases of problem solving, applying the tools learned.

   c. - Cite two references where additional information is readily available.

   d. - Do pluses and minuses of this workshop. What were your criteria? Use these criteria to suggest improvements in the workshop.

2. **Open book:**

   a. - What are the themes, patterns and key points you picked up?

ANNOTATED BIBLIOGRAPHY

(Listed in suggested order for reading)

1. Doyle, Michael and Straus, David, How to Make Meetings Work, Playboy Press, Chicago, Ill., 1976.
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2. Koberg, Don and Bagnall, Jim, Universal Traveller, Wm. Kaufmann, Inc., Los Altos, CA., 1976.
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3. Adams, James L., Conceptual Blockbusting, Stanford Press, Stanford, CA., 1974.
   How to identify and get past, or through blocks to thinking.

4. Nierenberg, Gerard I., The Art of Creative Thinking, Simon & Schuster, New York, 1982.
   Draws on many new areas of knowledge to bring new insight into creativity.

5. Ball, Geoffrey H., Using Graphics with Groups, Forum on Community and the Environment, 360 Bryant Street, Palo Alto, CA 94301, 1981.
   How graphics up-on-the-wall help groups works; processes and formats.

6. Fabun, Don, "You and Creativity", Kaiser Aluminum News, Vol 25, No. 3, Kaiser Aluminum and Chemical Corp., Oakland, CA., 1968.
   A delightful exploration of creativity.

APPENDIX

ACTIONS FOR REACHING CONSENSUS

Consensus -- meaning everyone agreeing to a course of action (even though it may not be anyone's total first choice) is an attitude more than it is a specific process.

When striving for consensus, people seek to advance both their interests and the interests of the others involved. Some actions that aid reaching consensus are:*

- Seek clarity - especially on key words.
- Slow down
- Get 'like abouts' out first
- Listen for areas of agreement
- Separate evaluation from generation of alternatives
- Can agree to disagree - and this gives the choice to someone else**
- Stay flexible - be creative and look out for your own interests
- Humor helps - especially puns

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* Ground rules for Terman Working Group, Palo Alto, 1981

** If the working group can't decide and if the situation demands action, then it often becomes the principal's responsibility to <u>form</u> and make the decision.

PROPOSED GROUND RULES

1. Humor helps.

2. Open discussion - Priority to the Committee and Alternates with audience second. Will encourage others to speak unless it becomes too cumbersome.

3. No smoking in the room. There will be a 5 minute break each hour to allow those who do smoke to either smoke in the hall or some other place in the building.

4. Set time limit for each person speaking to an item.

5. Avoid put downs and pot shots.

6. No more than one person angry at a time.

7. Avoid historical perspective - all coming into it equally.

8. All make effort to keep to point.

9. Order for speaking.

10. Agenda for each meeting - out early (preferably a week before).

11. Prior to disagreeing, restate view you have just heard.

12. Avoid using the words "winning" or "losing" or any other words relating to these two words.

13. Open Forum - relevant to items being discussed. (Only if necessary)

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* Ground rules developed by School Closure Committee, Palo Alto Unified School District, 1981-2. Many of the rules were specific to the school closure process.

FACTORS IN PROBLEM SOLVING

1. Projection	The tendency to see the problems as caused or to be solved by somebody else.
2. Role Prescription	Being unclear about the power of the people involved in the problem to solve it in the manner designed.
3. Complexity	Those who want the problem solved offer very simplistic ideas about how their aims can be accomplished. Those who are responsible for solving the problem tend to see only the complexities of the issue.
4. Time Factor	Those who want the problem solved feel that it can be resolved immeditely: whereas those charged with solving it "want more time."
5. Target Selection	Deciding which specific person, sets of behavior, or issues need to be picked for action.
6. Method of Approach	The specific tasks which need to be completed to obtain solution of the problem.
7. Secondary Gains	The positive accomplishments which can be obtained in addition to the original ones sought as a result of solving the problem.
8. Side Effects	The negative results that come from attempting to implement a specific solution.
9. Resistance Factors	Those built-in forces which slow down or prevent the problem for being solved or the goals of a specific project from being obtained.
10. Data Collection	The steps which must be taken to obtain information needed to make important decisions on any of the above issues.
11. Validity of Data	Checking to ensure that the answers which have been obtained from the data collection process are correct, or accurately reflect the opinions or ideas of the persons involved in the problem.
12. Division of Labor	Dividing up the tasks which must be accomplished in such a manner as to avoid any one person having more than they can accomplish within the time limits set for completing the tasks.

13. Skill Development	Identifying and learning those specific skills which must be required in order to accomplish the desired goals.
14. Practice Sessions	Trying out a developed plan with a special group to test the feasibility of the ideas. This procedure also allows for the possibility of ironing out any defects in the plan before it is given a full scale trial.
15. Feedback	Getting information from those who try out the new plan to see if it works. It is also important to see if the plan works as well as expected.

MEDIAN ESTIMATE METHOD

Groups often need to estimate the importance (priority, magnitude) of a collection of items. For example, you may with to estimate the number of hours per week to carry out an activity, or the relative importance of several issue areas - critically important, very important or important.

A simple procedure a group can use to make this estimate is as follows:

1. Establish

   a. Scale: e.g. 1 (easy) to 10 (hard)

   b. Categories: e.g. Critically Important, Very Important or Important.

2. Using cards taped to a wall, create this scale (1,---10,) or these categories (critically important, ---) on the wall. Then prepare cards with the name of each item on one card. Use masking tape to hold the cards to a wall. Tell people you will be asking them to raise their hand - and keep it up -- when they believe the value is less than (if you start from the low end) or greater than (if you start from the high end) the current value.

3. You then start by holding a card with the name of the item under a category, for example, "critically important," or under a value, say 1. If half of the participants (have someone help you count) consider the item critically important, then place it under critically important. If less than half consider it critically important, then ask, "How many consider this item <u>either</u> critically important or very important?"

   If half do, then place it under Very Important. If less than half do, then place it under Important. (In general, you will be working only with the Critically Important and Very Important items, hence it does not seem worth the conflict to ask if people consider an item important. An exception may be criteria where having the discussion related to deleting a proposed criterion entirely can be educational for the group.)

4. If you are estimating a numerical value (such as difficulty) then slowly move the card under the scale from one end to the other while asking people to raise their hand when you pass their estimate of the value of that item.

   Place the card at the group's median estimate, then proceed to estimating the next card.

5. When all items have been estimated, you can then ask people if there are any items they feel should be moved. If there are, then discuss why that item should be moved and then re-estimate its position using Steps 1-4.

Comment

This procedure is simple, fast and gives people a chance to re-evaluate their first estimate using the entire set of items as a guide by looking at the wall where the cards representing the items are presented.